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09/889895
JC17 Rec'd PCT/PTO 24 JUL 2001

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Vision aid

The invention relates to a vision aid with the features of the introductory part of claim 1 with an autofocussing means, with a means for changing the focal length and with a means for matching the parallax between the tubes of the vision aid to the respectively set focal length.

One such vision aid (telescopic spectacles) with an autofocussing means, with a means for changing the focal length and with a means for matching the parallax between the tubes of the vision aid to the respectively set focal length, is disclosed in WO 96/09566 A (or the essentially identical US 5 971 540 A). The known vision aid is intended for use as telescopic spectacles.

The known telescopic spectacles have an automatic and/or manual focussing means, a device for manually changing the magnification factor, and a device for automatic, mechanical parallax compensation corresponding to the respective focal length. If for example during vascular surgery, as a result of the location of the various surgical sites, a change of the working distance is necessary, the focal length and the parallax angle are automatically or manually adapted to the new working distance. This ensures optimum adjustment of the vision aid corresponding to the surgery. In addition, the user of the vision aid can assume the ergonomic position which is most advantageous at the time so that it is possible to operate without fatigue. In addition, the known vision aid makes it possible to adapt the magnification factor at each chosen working distance to the respective requirement. The known vision aid which is worn using a headset allows the user to largely freely choose the working distance and the magnification factor used. The control device is a foot-

operated switch. In order not to lose the 3-D image when the working distance and the sharpness setting change, the known vision aid uses an autofocussing means which, by mechanically changing the angle of the tubes of the vision aid to one another, matches the parallax angle to the respective focal length. This type of matching of the parallax to the focal length which has been set at the time entails many defects.

(1) The tubes are mechanically adjusted by motors via gearing; this means a relatively great weight and thus little wearing comfort for the user.

(2) Since the tubes of the vision aid must be made movable to one another according to the lengthwise axis, the resistivity of the system to mechanical stress suffers.

(3) Each time the working distance changes, the parallax compensation means changes the position of the tubes to one another and thus also the angle of the eyepiece planes to the eyes of the user. This can lead to disruptive reflections and to a reduction in the size of the entry pupil and thus of the visual field.

(4) In practice it is hardly possible to produce systems which are independent of the user with this type of parallax compensation, i.e. each system is tailored to a certain user and his distal pupil distance. This necessitates higher investments if for example hospitals want to ensure than all surgeries can be carried out with autofocussing telescopic spectacles.

(5) If correction glasses which project over the eyepieces are attached to the latter, these glasses can touch the face of the user under certain circumstances when the position of the tubes change and thus distract him.

Furthermore, it would often be of great benefit to the user, for example in surgery, to be able to look at additional information such as the vital signs of the patients from the monitoring system, measurement scales or also x-ray, computerized tomography or other data during use of one such vision aid. The currently known telescopic spectacles do not offer this possibility.

Similar telescopic spectacles are known from AT E 98782 B.

US 5 078 469 A discloses telescopic spectacles to which a video camera and a display unit are connected in order to take pictures of the surgical field.

WO 95/25979 A discloses a surgical microscope which has means for producing and displaying the three-dimensional video data of the surgical field and for reflecting in additional information, such as patient data.

US 4 621 283 A describes a device to be worn on the head of a surgeon with telescopic spectacles and a photographic camera and a light source, the camera and the light source, regardless of the circumstance that they are worn on the top of the head at a distance, having a viewing direction which is essentially parallel to the viewing directions through the telescopic spectacles in front of the eyes of the surgeon, so that the image field viewed by the surgeon can be transmitted essentially from the same viewing angle via the recording means to a display screen.

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The object of the invention is to make available a vision aid which is worn on the head and which allows the user to change the working distance and to use different magnification factors which are matched to the respective activity. Furthermore, the 3-D image will be preserved without the position of the two tubes of the vision aid to one another having to be altered, as is the case in the vision aid known from WO 96/09566. In addition, the user is to

be enabled to look at additional information in text or image form originating from external data sources and to eliminate possible defective vision by the corresponding settings on the eyepieces of the vision aid.

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This object is achieved as claimed in the invention with a vision aid which is characterized in that using the adjustable optical elements which are provided in the beam path of the vision aid the angle between the beam paths running from the tubes to the object can be changed.

Preferred and advantageous embodiments of the vision aid as claimed in the invention are the subject matter of the dependent claims.

The vision aid as claimed in the invention represents a completely new application or (product) class. On the one hand, it differs from telescopic spectacles or surgical microscopes mainly in that complete, free mobility during use which had been unknown in the past is possible by the features autofocus, optical parallax compensation and variable zoom. The vision aid as claimed in the invention differs from surgical microscopes mainly in that it can be worn on the head of the user by means of a headset.

The vision aid as claimed in the invention can be used not only in surgery on the human body or on animals, but wherever the user wants to see a working field magnified.

The invention makes available a light, stable and comfortable stereoscopic vision aid with a variable magnification factor, autofocus and automatic parallax compensation and with the possibility of compensation for defective vision, the angle of the tubes of the vision aid to one another not needing to be changed. This feature also allows a form of construction of the vision aid such that the two beam paths can be housed in a single, preferably oval tube. Furthermore, additional visual information can be offered to the user.

In the preferred embodiment the vision aid as claimed in the invention offers at least one of the aforementioned possibilities.

When the vision aid as claimed in the invention is being used in surgery, the working distance of the surgeon using the vision aid of the invention can be changed - for example to enable an assistant to look better into the surgical field without the magnification factor changing.

Furthermore, the size of objects, for example a tumor, can be subjected to more accurate determination without the need to adapt the magnification factor.

During an operation, brief crossing of the beam path between the objective lens and the surgical field often occurs; in the known telescopic spectacles this leads to unwanted adaptation of the focal length to the crossing object with a subsequent readaptation to the original viewing field by the autofocussing means. This can be avoided in the invention by the automatic change of the focal length being provided with a delay switch and therefore a change of the working distance leading to a focal length optimized to the new working distance only after an adjustable time and/or with a selectable speed. The reaction time of the autofocus part can therefore be matched to a certain situation or a personal working style.

Especially in the surgical version one embodiment of the invention allows students observing the surgery to follow the procedure in exactly that perspective which is also offered to the surgeon.

Especially in surgery in body cavities does the problem of optimum illumination often arise: the ceiling light often can hardly be moved into the proper position, a light source attached to a headset necessarily has a parallax angle to the optimum beam path between the objective lens and the viewing field; this leads to unwanted formation of cast shadows in body cavities with a small diameter. For assisting physicians it can also be advantageous to recognize the exact viewing field of the surgeon in order to direct their attention thereto.

Applications of the invention are also conceivable in which the autofluorescence properties of tissues are used. For this purpose a UV/IR or laser light source combined with the vision aid as claimed in the invention can be used, with or without different filter and frequency changing systems.

There are also application situations in which an intensified 3-D impression would be advantageous. This is done by the invention in one embodiment by a device for increasing the distance of the objective lenses from one another.

Often the user of the vision aid as claimed in the invention, for example to orient himself during an operation in the manner of a general survey, looks past the telescopic spectacles which are mounted in front of his eyes. When there is defective vision this is only practicable when correction glasses are attached to the eyepieces of the telescopic spectacles. These correction glasses, in order to avoid reducing the optical quality when the parallax angle changes, execute parallax adaptation at the same time in one embodiment of the invention when the focal length of the telescopic spectacles changes.

Defective vision which cannot be corrected by diopter compensation mounted on the eyepieces is a problem when using the vision aid known from WO 96/09566 and is eliminated in one embodiment of this invention by correction glasses which are attached to the eyepieces.

Also absorbing, reflecting or filtering protective glasses which are easy to clean and which are preferably provided as claimed in the invention as well as reflections of information, for example surgical parameters, into or next to the immediate visual field are advantageous in several conceivable applications.

For accurate quantitative determination of objects, a measurement scale which is made as a liquid crystal display, LED, vacuum fluorescence or gas discharge display or also in another form can be introduced in an intermediate image plane in the invention.

Furthermore, in one embodiment, by reflecting part of the beam path out onto a CAD camera module, a possibility arises which is desirable in the surgical version for example for observing the course of the surgery via a monitor.

A light source which is preferably provided, which is integrated into the optical system or which is made as a variable-aperture fiber bundle when using this embodiment of the vision aid of the invention compared to known vision aids is important. Light is coupled preferably by a beam splitter or into the prism surface of the prism reversal system. The light source can emit UV/IR or laser light for observation. The light reflected by the object can be absorbed or reflected by a filter in the eyepieces. The use of infrared light, ultraviolet light or laser light can be of great diagnostic value.

Parallax compensation when the focal length changes without changing the tube or eyepiece distances can be done in the

invention by for example an electric motor mounted in the middle part of the vision aid simultaneously moving laterally and/or axially and optionally tilting the respective objective lens or a part thereof (front element), cam-controlled, via the corresponding sheathed cables or gearing. By using axial displacement, focussing (change in the focal length) to different distances can take place. In the base setting of the vision aid (the optical axis of the movable objective lens or part of the objective lens is in the optical axis of the vario extension) the distance setting and the convergence angle are preferably adjusted to a medium working distance so that the optical axes of the eyepieces run through the optical center points of the eyes. When the working distance changes, the objective lenses or for inner focussing the corresponding parts of the objective lens can be displaced axially so far that the object-side system focal points are in the object plane. At the same time, in the invention lateral motion controlled via cams can take place, of the type that the focal points of the two objective lenses are guided exactly along the plane of symmetry of the vision aid. For parallax compensation then neither an angle change nor a distance change with respect to the optical axes of the eyepieces is necessary.

Furthermore, at the same time, by tilting the objective lenses or parts thereof, correction of the image errors which occur due to their lateral offset (for example, astigmatism, tilting of the image plane) can be caused. The aforementioned motions of the objective lenses or parts of the objective lenses can also be accomplished by electrical or pneumatically operated linear drives of actuators.

The relationships between

a) sharp focussing of the lens systems by changing the focal length and
b) changing the magnification factor of the lens systems can be explained as follows:

In order to obtain a sharp picture at a given distance between a lens system and an article/object field, the focal length of the lens system must be changed according to the distance between the article/object field, for example with an autofocussing means. This "sharp focussing" yields a sharply focussed image with a size which is dependent solely on the distance between the lens system and the article/object field. The size of the sharply focussed image of the article/object field can only be changed by the distance between the article/object field and the lens system being changed (greater distance: smaller picture - smaller distance: larger picture). Changing the focal length of a lens system with a zoom means on the other hand yields a magnification or reduction of the image of the article/object field without the distance between the lens system and the article/object field being changed, therefore only by changing the focal length using the zoom means. Therefore both "sharp focussing" of a lens system with an autofocussing means and also adjustment of a zoom means imply a change of the focal length. Regardless of this, an autofocussing means and a zoom means are not one and the same.

This principle can be stated as follows on objective lenses of cameras: an autofocus camera without the zoom function can represent a certain tree, sharply focussed, as larger or smaller, but only when the camera is first nearer, then again farther away from the tree. In both cases it records the images with different focal length. A camera with a zoom objective lens on the other hand can record the tree from one location, one time larger, then again smaller - it also does this with different focal lengths, but it also has a zoom means. Since a zoom means requires an addition group of lenses with an adjustment mechanism in the lens system, the much higher price, the different (lower) light intensity and usually larger dimensions of these lens systems are obvious.

Other details, features and advantages of the invention follow from the following description of preferred embodiments of a vision aid

(telescopic spectacles) of the invention using the schematic drawings.

Figure 1 shows a vision aid;

Figure 2 shows a vision aid with an illumination means;

Figure 3 shows an embodiment in which the distance of the objective lens can be changed;

Figure 4 shows a vision aid with the laser light source assigned to it; and

Figures 5 and 6 show a headset for the vision aid;

Figures 7, 7a and 7b show one embodiment with a device in front of the sensor for the autofocussing means,

Figure 8 shows an embodiment in which the two lens system are housed in a common tube,

Figure 9 shows in a schematic representation one embodiment of the vision aid with a means for preventing the entry of outside (infrared) light into the receiving part of the infrared autofocussing means,

Figure 10 shows in a representation similar to that of Figure 9 another embodiment of the means for preventing the entry of outside (infrared light) into the receiving part of the infrared autofocussing means, and

Figure 11 schematically shows a block diagram of the arrangement of a transparent display in the beam path of the vision aid.

Figure 1 shows a vision aid ("telescopic spectacles") consisting of two tubes 1, eyepiece parts 2, an autofocussing means 4 which is mounted in the middle in this embodiment with an infrared diode 5 and a receiving unit 6. The tubes 1 can be connected to one another fixed, or as shown in Figure 1, by segments 17 of adjustable length. An external switch 3 and an external electronic unit 7 can be connected to the vision aid by cable, or, as in this embodiment, without a cable, for example by radio transmitters 8 and radio receivers 9 or otherwise.

Figure 1 furthermore shows two bent boards in this example which are housed in the tubes 1 as guides 12 on which optical elements 11 can be moved back and forth by servomotors 10 such that the refractive property of their respective position yields the angle 13 necessary for each selected working distance A between the beam paths 14 emerging from the tubes 1. The optical elements 11 with the corresponding shape can also be housed in the tubes or placed in front of them. The optical elements 11 can also be movable on straight or bent boards. The optical elements 11 can also be only rotated or tilted. The measurement basis for the positioning of the optical elements 11 is delivered by the autofocussing means 4. The computation of the position of the optical elements 11 which is necessary for parallax compensation is prepared by the electronic unit 7. The electronic unit 7 also determines the position of the lens system of the focussing unit 14 which is optimum for each working distance A. This position is likewise brought about by the servomotors 10.

Furthermore, Figure 1 shows a lens system 15, using which after activation by the external switch 3 or via voice control the magnification factor ("zoom") of the vision aid can be continuously changed.

All other functions of the vision aid can be activated, deactivated or changed by means of the external switch 3 or via voice control.

If necessary, additional information, such as the vital signs of a patients, computerized tomography or x-ray data or pictures, measurement scales or the like can be inserted into the optical plane 16 which is located within the two tubes 1. Alternatively or additionally, displays 18 can also be mounted next to an eyepiece 2 or next to the two eyepieces 2 and can display this additional information. Insertion of information can also take place stereoscopically, i.e. with individual pictures corrected with respect to parallax and/or eye distance and can be fixed as an entire or partial picture ("freeze-frame").

The additional information converted into video form can be displayed faithfully in position relative to the viewed object. This can take place by using optical, electromagnetic or other positioning systems together with inertial sensors. This system can also be used to determine the position of objects, for example, surgical instruments relative to a patient, and to display it via an optical plane in the beam path of the vision aid or via externally mounted displays.

These inertial sensors, linear or angle encoders or also ultrasonic, infrared or other system can also be used to acquire the current parameters of the vision aid, for example the magnification range, distance to a viewed object, etc, and can be used for modification of additional computer-generated or optical information and/or displayed.

The vision aid as claimed in the invention can furthermore be equipped with a device for illumination of the working area. In doing so the light necessary for this purposes can be guided forward into the vicinity of the plane of the objective lens of the vision aid by means of fiber optics from an external light source via the headset. A lens system can be attached to the end of the optical fiber and it concentrates the emerging light according to the chosen working distance and magnification factor such that the

working field is optimally illuminated in terms of size and intensity. The measurement data necessary for this purpose can be received from internal or external sensors. Alternatively or additionally, light can also be coupled by means of fiber optics into the optical system of one tube 1 or the two tubes 1 such that it is routed to the object within the optical system coaxially to the optical beam path 14. In this way a parallax angle between the optical beam path 14 and the illumination of the working area is prevented.

The above described matching of the light intensity and size of the illuminated surface for matching to the magnification chosen at the time and to the respective working distance can take place within the optical system of the vision aid.

Figure 2 schematically shows coupling of light for coaxial illumination of the object field. In doing so light is guided into the optical elements 21 from an external light source 19 via optical fibers 20. These elements 21 cause coaxial alignment of the light beam 23. Illumination which is optimum for each working distance in intensity and size is ensured by a lens system 22 via servomotors 10 which are connected without cables or, as in this application, by means of cables 24, to the external electronics 7 for purposes of transmission of positioning data.

Often, for example in microsurgery, matching the 3-D effect to the respective application or to the surface structure of the object area viewed at the time is desirable. The vision aid as claimed in the invention solves this problem with a device with which the distance between the objective lenses of the vision aid can be changed when the distance between the eyepieces 2 remains the same. Figure 3 schematically shows one embodiment of the vision aid as claimed in the invention with a device 25 for adjusting the distance of the tubes 1 which are connected to one another by segments 17 of variable length when the distance 26 of the

eyepieces remains the same and thus also for adjusting the 3-D effect which arises for the user. This device 25 in this embodiment is made as a component on which the eyepieces 2 can be pushed diametrically opposed in order to keep the distance 26 between them constant as the distance 27 of the tubes 1, therefore the objective lenses, from one another, changes, without in doing so losing the imaging of the object area. This effect can however also be achieved by movable optical components in front of the objective lenses or within the tubes 1.

To vary the magnification range of the vision aid, in addition to the optical system in the tubes 1 or alternatively thereto interchangeable eyepieces and/or interchangeable objective lenses can be used.

In medical diagnostics, a process is used which is called photodynamic diagnosis. Here a photosensitive substance is used which accumulates in certain, for example malignant tissue parts and afterwards by irradiation with light of a certain wavelength - for reasons of its penetration depth of roughly 5 mm normally red laser light is used - is made visible. Another possibility is to use the different autofluorescence properties of healthy and malignant tissue parts under light with a certain wavelength in order to make visible certain carcinomas or precarcinogenic tissue parts. Currently a number of systems are known for performing these tasks, generally using an endoscope or an surgical microscope. Although the use of this technology would be very advantageous, for example during open surgeries, for a long time there have been no vision aids worn on the head which would allow their use in this diagnosis. The vision aid as claimed in the invention can be made in an embodiment such that filters can be placed in the beam path of the optical system and they enable or facilitate the perception of certain reflection properties of the viewed object area which have arisen due to irradiation with light of a certain wavelength. For cases in which the reflection differences of the viewed object

field, for example autofluorescence of the tissue sites, cannot be recognized purely visually, one embodiment of the vision aid can be equipped with an internal and/or external receptor, for example a camera chip which records the light which has been guided from the light source directly or via an external or internal coaxial fiber optic system to the viewed object and which is reflected thereby, analyzes it via internal or external software applications, and thus assigns different colors to healthy and suspicious tissue parts. These colors can then again be reflected into one tube 1 or into the two tubes 1 of the optical system and can be viewed by the user there. The colors can also be reproduced via external displays or monitors, optionally with a hairline reflected in, which hairline shows the position and size of the light beam on the object. This can lead to improvements in the radicalness of removal or early detection of carcinomas for example in open surgical tumor removal.

Figure 4 schematically shows a vision aid consisting of the tubes 1, the eyepieces 2, the connecting segments 17 which have an adjustable length, in the optical systems of which there are two filters 28 each. The filters 28 can be pushed manually or by motor, for example by lateral displacement on a board, into and away from their active position.

Furthermore, in Figure 4 a laser light source 29 with an optical fiber 20 which in the concrete embodiment illuminates the object field 30 from one position between the two tubes 1 of the vision aid and penetrates to under the surface of the object field 30. The light 31 which has been reflected by a (surface) carcinoma 32 has different properties than light 33 which has been reflected by healthy tissue. These differences are made visible either by reflecting out the image, analyzing the image, color coding the image and reflecting the image back in, or as shown in Figure 4, by the filter 28 which has been pushed into its active position 28.

In the known vision aids which are worn on the head the problem of the tilting moment produced by the weight of the vision aid and its necessary distance from the eyes of the user had remained unsolved for a long time. The vision aid as claimed in the invention in one embodiment (Figures 5 and 6) solves this problem by attaching a bent tension brace 35 which runs over the lengthwise axis from the rear part to the front part of the headset 34 and/or a weight 36 which is attached to the rear part of the headset 34. In this way the center of gravity is shifted away from the sensitive forehead and nose area of the user towards the unproblematical center of the head and thus also to the ergonomically desirable lengthwise axis of the body is achieved.

Figure 5 shows a headset 34 with a tension brace 35 and a counterweight 36.

Figure 6 shows a schematic vertical section of the headset 34. Here it can be seen how the tilting moment 38 which is triggered by the weight of the vision aid 37 and the distance from the eyes of the user is balanced by the counterweight 36 with the tension brace 35 which is adjustable in its length by an adjustment means 41. The weight can thus be shifted along the lines 39 of force to the lengthwise axis 40 of the user on the middle of his head.

Especially at high magnifications in vision aids worn on the head did the problem of "quivering" and "blurring" occur in the past. The vision aid as claimed in the invention solves this problem in one preferred embodiment by active and/or passive vibration damping.

It can happen that a user of the vision aid when viewing an object might not want to sharply see the area acquired by the middle-accentuated autofocus, but a different area which is located for example on the edge of the picture. The vision aid as claimed in the invention can therefore be equipped with a device for detection

of the location of the pupil of the user, coupled to multiple autofocus areas and a pertinent control unit.

There are circumstances under which it would be desirable for the user of a vision aid worn on the head to be able to control the functions of the vision aid and/or external devices without needing to touch a switch. Voice control which can be used for this purpose cannot be used under all conditions. For this reason, in the relevant areas of the headset of the vision aid as claimed in the invention electrodes can be attached which pick up the brain currents of the user and use them to control the described functions of the vision aid and/or for reconstruction of the pictures perceived by the user.

Furthermore, in relevant areas of the headset biofeedback sensors can be attached which can establish the location of the user. The information obtained therefrom can then be used in the most varied ways, for example to warn a surgeon in case of excess stress or exhaustion and fatigue.

In the embodiment shown in Figure 7, Figure 7a, and Figure 7b, in the autofocussing means 4 which is made as an infrared (IR) system, on the receiving unit 6 thereof there is a device which prevents the infrared radiation 43, 44 which is not reflected from the object field 30, which does not originate from the autofocussing means 4, or which belongs to it from entering the autofocus receiving unit 6. These reflected infrared rays 48 which do not belong to the autofocussing means 4 can originate from passive infrared image following or navigation systems 42.

The device formed for example as a filter, especially a polarization filter 45 (Figure 7), as a tube 47 which is pointed towards the object field (Figure 7b) or as a louver or grating attachment 46 which is pointed straight or obliquely (Figure 7a)

therefore prevents unwanted influences on the autofocussing system 4.

In the embodiment of the vision aid as claimed in the invention shown in Figure 8 the two lens systems 51, 52, therefore the right and the left lens system, are housed in a common tube 50 (monotube). The lens systems 51, 52 which are housed in the common tube 50 are protected for example by covers 53 on one or on both ends of the tube 50 from the penetration of impurities and against the incidence of outside and scattered light. Thus, working with the vision aid as claimed in the invention which has not been adversely affected by the incidence of outside or scattered light is possible.

A common tube 50 as is shown for example in the embodiment of Figure 8 offers the advantage that the vision aid does not need moving parts which lie to the outside. This has among others the advantage of better stability, insensitivity of the vision aid to impact, tension, and twisting. In addition, the vision aid can be made sealed in the embodiment from Figure 8 against penetration of moisture so that there is protection against penetrating water splashes and it becomes possible to place the vision aid as claimed in the invention in a disinfection solution. Finally, there is no danger that parts can fall from the vision aid as claimed in the invention onto the surgical field.

As in the other embodiments of the vision aid as claimed in the invention the parallax angle is compensated when the focal length is changed by optical elements 11 within the common tube 50, as has been described in conjunction with the other embodiments (especially Figure 1).

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In particular, in surgeries, for example surgeries on the human brain, in which the surgeon cannot directly view the surgical field, but only via contrivances, infrared-controlled devices are

used to track the location of the instruments relative to the patients and to display it on a monitor. These devices (infrared tracking means) have proven themselves extraordinarily well. When a vision aid as claimed in the invention is used at the same time with one such infrared tracking means, there is the danger that infrared light emitted from the infrared tracking means will adversely affect the autofocussing means of the vision aid which is likewise infrared-controlled. To take remedial action, in the vision aid as claimed in the invention parts can be assigned to the autofocussing means to prevent the incidence of outside light or scattered light, especially light from infrared tracking means 60. This was explained in principle further above using Figures 7, 7a and 7b. Also when using the vision aid as claimed in the invention in the area of industry the infrared portion of daylight can also be disruptive. In order to prevent disruptive infrared light from adversely affecting the autofocussing means 4 of the vision aid as claimed in the invention, in one embodiment of the invention according to the vision aid measures are taken which prevent the incidence of disruptive infrared light which can originate from infrared tracking means 60 and/or by daylight.

One embodiment of one such means is shown in Figure 9. It consists of several louvers which are aligned parallel to one another and which project over the entry opening 63 of the infrared receiver of the autofocussing means 4 so that the infrared receiver 6 of the autofocussing means 4 of the vision aid as claimed in the invention cannot receive infrared light 61 which is obliquely incident, since this is prevented by the louvers 62 which are located in front of the receiver 6 at the inlet to the receiver 6. Infrared rays which are aligned exclusively parallel to the viewing direction of the infrared receiver 6 can strike the receiver 6.

To prevent, for example when using infrared trackers, the scattered infrared light which is used in surgical navigation systems and which is intended for position determination of surgical

instruments from entering the receiving unit 6 of the autofocussing means 4 of the vision aid as claimed in the invention and thus to avoid disruptions of the focussing process caused by scattered infrared light, the embodiment shown in Figure 10 can be used. In this embodiment, in front of the receiver 6 of the autofocussing means there is a tubular screen 65 similar to a sunshade which is used in front of the objective lenses of a camera. Figure 10 shows that infrared light 61 which originates from the infrared tracking means 60 cannot reach the receiver 6 of the autofocussing means 4. Only infrared light 66 which has been emitted by the infrared means 5 which belongs to the autofocussing means 4 of the vision aid as claimed in the invention and which was reflected by the object plane 30 (object field) can reach the receiver 6. Infrared light 61 which proceeds from the infrared tracker 60, which is conventionally attached overhead, cannot enter the entry opening 63 of the infrared receiving unit 6 of the autofocussing means of the vision aid as claimed in the invention. The tube 65 which is pointed towards the object field in front of the receiving part 6 of the autofocussing means 4 can be coated for intensifying the effect on the inside with light-absorbing material or can be made of this material.

Alternatively to the embodiments shown in Figures 9 and 10 it is also possible to prevent outside light incidence (incidence of infrared radiation) by various (polarization) filters.

To reflect data and other information into the vision field of the vision aid as claimed in the invention, various possibilities have been opened up. Disadvantages of known possibilities for reflecting data and other information into the vision field of the vision aid as claimed in the invention, have the defect that the reflected-in data or other information (computer tomography and magnetic resonance images) cannot be displayed brightly enough and with sufficient contrast to enable the user of the vision aid as claimed in the invention to work without fatigue.

Figure 11 schematically shows one embodiment of a vision aid as claimed in the invention with which data and other information can be easily reflected into the vision field of the vision aid as claimed in the invention. In the embodiment shown in Figure 11, in the beam path between the objective lens 70 and the eyepiece 71 of the vision aid as claimed in the invention, preferably between the telecompressor 72 and the teleconverter 73, there is a transparent display 74. This transparent display 74 shows an inverted image of the main display 75 to the extent there is no beam splitter 80 between the teleconverter and the eyepiece. In this connection the beam splitter 80 is defined as an optical means which partially reflects light beams, therefore deflects them for example by 90°, and in part is transparent to light beams. This beam splitter 80 can be a Porro prism or a partially transparent mirror. This results in that at the site at which the data and other information are inserted into the vision field of the vision aid as claimed in the invention the image produced by the vision aid is masked out. In this way the graphics (inserted data and other information) becomes brighter and has higher contrast because they do not conceal the image. In the embodiment shown in Figure 11 the main display 75 accepts information from external sources, for example, magnetic resonance displays or computer tomographic devices, digital x-ray machines, etc. and reflects it into the beam path of the vision aid as claimed in the invention via projection optics and the beam splitter 80.

It is therefore important in the embodiment shown in Figure 11 that the object image is darkened or attenuated wherever the information of the main display 75 is displayed, so that the data and other information are better visible on the main display 75.

In summary, one preferred embodiment of the invention can be described as follows:

A vision aid in the form of telescopic spectacles has two lens systems which comprise at least one objective lens 70 and one eyepiece 71 each. An autofocussing means is assigned to the lens systems and changes the focal length of the lens systems for sharp focussing of the latter according to the distance of the telescopic spectacles from the object. Furthermore, a means for changing the magnification factor by changing the focal length of the lens systems ("zoom") and finally a means for matching the parallax between the lens systems of the vision aid to the focal length which is set each time according to the distance of the telescopic spectacles from the object are assigned to the lens systems. The parallax is matched using adjustable optical elements 11 which are provided in the beam path of the lens systems, with which elements the angle 13 between the beam paths 14 which run from the lens systems 1 to the object can be changed.